constant magnetic field.

14. A cyclotron according to claim 11, wherein the source of magnetic field comprises an electromagnet.

15. A cyclotron according to claim 11, wherein the source of magnetic field comprises a permanent magnetic.

16. A cyclotron according to claim 11, wherein the source of magnetic field comprises a superconductor.

17. A cyclotron according to claim 11, wherein the source of magnetic field is constructed and arranged to a provide a longitudinally magnetic field.

18. A cyclotron according to claim 11, wherein the source of magnetic field is constructed and arranged to a provide a magnetic field parallel to a discharge electric field.

19. A cyclotron according to claim 11, wherein the cell and source of magnetic field are constructed and arranged such that during operation of the cell ions orbit in a circular path in a plane transverse to the magnetic field for sufficient field strength at an ion cyclotron frequency ω_c that is independent of the velocity of the ion.

20. A cyclotron according to claim 11, wherein the antenna is tuned such that during operation the ions comprise electrons in a plasma and the antenna is tuned to receive power emitted by the electrons.

B' cont

21. A power source according to claim 1, further comprising an electromagnet for producing the applied magnetic field.

22. A power source according to claim 1, further comprising a permanent magnet for producing the applied magnetic field.

23. A power source according to claim 1, further comprising a superconductor for producing the applied magnetic field.

24. A power source according to claim 1, wherein the applied magnetic field comprises longitudinally magnetic field.

25. A power source according to claim 1, wherein the applied magnetic field is parallel to a discharge electric field.

26. A power source according to claim 1, wherein the energy cell and applied magnetic field are constructed and arranged such that when operating, ions of the plasma orbit in a

circular path in a plane transverse to the applied magnetic field for sufficient field strength at an ion cyclotron frequency ω_c that is independent of the velocity of the ion.

27. A power source according to claim 1, wherein the antenna is tuned such that during operation electrons are produced in a plasma and the antenna is tuned to receive power emitted by the electrons.

28. A cyclotron or power source according to one of claims 1 and 11, further comprising an oscillator circuit in communication with the antenna.

29. A cyclotron or power source according to claim 28, wherein the circuit is constructed and arranged to provide a voltage that varies sinusoidally about a central value.

30. A cyclotron or power source according to claim 28, wherein the circuit comprises at least two parallel plates situated between pole faces of a magnet.

31. A cyclotron or power source according to any one of claims 1 and 11, wherein the cell comprises a tunable resonator cavity.

b' cnt

32. A cyclotron or power source according to any one of claims 1 and 11, wherein the cell comprises a tunable waveguide.

33. A cyclotron or power source according to one of claims 1 and 11, further comprising a source of an electric field in the cell.

34. A cyclotron or power source according to one of claims 1 and 11, further comprising a source of an electric field in the cell constructed and arranged for adjusting a rate of catalysis of hydrogen during operation of the cell.

35. A cyclotron or power source according to one of claims 1 and 11, further comprising a source of an electric field in the cell constructed and arranged for focusing ions in the cell during operation.

36. A cyclotron or power source according to one of claims 1 and 11, further comprising a source of an electric field in the cell constructed and arranged for imparting a drift velocity to ions during operation.

37. A cyclotron or power source according to one of claims 1 and 11, further comprising a converter for converting power received by the antenna during operation into electrical power.

38. A cyclotron or power source according to one of claims 1 and 11, wherein the antenna comprises one or more coils.

50. A cyclotron or power source according to one of claims 1 and 11, further comprising a cyclotron resonance spectrometer constructed and arranged for analyzing ions formed during operation.

51. A cyclotron or power source according to one of claims 1 and 11, further comprising a rectifer in communication with the antenna for rectifying the power output.

52. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a magnetron.

53. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a Cherenkov device.

54. A cyclotron or power source according to claim 53, wherein the device comprises a traveling-wave tube.

55. A cyclotron or power source according to claim 53, wherein the device comprises a backward wave oscillator.

B' cont

56. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a Smith-Purcell device.

57. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a Klystron device.

58. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a deflection-modulation device.

59. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a scanning-beam device.

60. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a gyrocon device.

61. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a bremsstrahlung device.

62. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a cyclotron resonance maser device.

63. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a smooth anode magnetron device.

64. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a phasochronous device.

65. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a cyclostron autoresonance maser device.

66. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a relativistic gyrotron device.

67. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises an axisymetric gyrotron device.

68. A cyclotron or power source according to claim 67, wherein the axisymetric gyrotron device comprises a cathode and a solenoid.

69. A cyclotron or power source according to claim 67, wherein the axisymetric gyrotron device comprises a magnetic mirror.

70. A cyclotron or power source according to claim 67, wherein the axisymetric gyrotron device comprises a reversed magnetic mirror.

71. A cyclotron or power source according to claim 67, wherein the axisymetric gyrotron device comprises an extended surface collector.

72. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a gyrotron autogenerator device.

73. A cyclotron or power source according to one of claims 1 and 11, wherein the cyclotron or power source comprises a magnetic induction power converter device.

74. A cyclotron or power source according to claim 73, comprising at least one coil for producing a time dependent voltage, the coil being constructed and arranged to have a plane perpendicular to magnetic flux of the applied magnetic field or provided by the source of magnetic field.

75. A cyclotron or power source according to one of claims 1 and 11, further comprising a source of an electric field that is constructed and arranged to modulate an intensity of the catalysis reaction over time.

76. A cyclotron or power source according to one of claims 1 and 11, further comprising a photovoltaic power converter and at least one phosphor for converting short wavelength light to longer wavelength light, wherein the photovoltaic power converter is constructed and arranged to receive light from the cell.

source of catalyst.

104. A cyclotron according to claim 103, wherein the aspirator, atomizer, or nebulizer are constructed and arranged for injecting the source of catalyst or catalyst directly into the plasma during operation.

105. A cyclotron according to claim 11, wherein the cell is constructed and arranged such that during operation a catalyst or source of catalyst is agitated from a source of catalyst and supplied to the vessel through a flowing gas stream.

106. A cyclotron according to claim 105, wherein the flowing gas stream comprises hydrogen gas or plasma gas which may be an additional source of catalyst.

107. A cyclotron according to claim 11, wherein the source of catalyst is dissolved or suspended in a liquid medium.

108. A cyclotron according to claim 107, wherein the cell is further constructed and arranged such that the source of catalyst is dissolved or suspended in a liquid medium and aerosolized during operation of the cell.

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109. A method of making power using a cyclotron comprising a cell, a source of hydrogen in communication with the cell, a source of catalyst having a net enthalpy of reaction of about m x 27.2 eV, where m is an integer, in communication with the cell, a source of a magnetic field, and at least one antenna, the method comprising:

supplying hydrogen atoms to the cell;

supplying catalyst to the cell having a net enthalpy of reaction of about m x 27.2 eV, where m is an integer, wherein a hydrogen catalysis reaction occurs between the hydrogen atoms and the catalyst that releases energy from the hydrogen atoms and forms hydrogen atoms having lower energy states, the energy release being sufficient to form a non-thermal plasma comprising ions;

applying a magnetic field to the plasma for causing the ions to orbit in the cell; and

receiving power from the orbiting ions using the antenna.

110. A method according to claim 109, further comprising applying a resistive load the one antenna.

111. A method according to claim 109, further comprising applying a constant magnetic field to the ions.

112. A method according to claim 109, wherein the magnetic field is applied using an electromagnet.

113. A method according to claim 109, wherein the magnetic field is applied using a permanent magnetic.

114. A method according to claim 109, wherein the magnetic field is applied using a superconductor.

115. A method according to claim 109, wherein a longitudinally magnetic field is applied to the ions.

116. A method according to claim 109, further comprising applying a magnetic field parallel to a discharge electric field.

117. A method according to claim 109, wherein the magnetic field is applied such that ions orbit in a circular path in a plane transverse to the magnetic field for sufficient field strength at an ion cyclotron frequency ω_c that is independent of the velocity of the ion.

118. A method according to claim 109, wherein the ions comprise electrons and the antenna receives the electrons.

119. A method according to claim 109, wherein the total pressure of the cell is maintained such that the ions have a sufficient mean free path to emit radiation to the antenna.

120. A method according to claim 109, further comprising using an oscillator circuit in communication with the antenna to receive power from the ions.

121. A method according to claim 120, wherein the oscillator circuit provides a voltage that varies sinusoidally about a central value.

122. A method according to claim 120, wherein the circuit comprises at least two parallel plates situated between pole faces of a magnet and the alternating electric field due to the orbiting ions is normal to the magnetic field.

123. A method according to claim 109, wherein the cell comprises a tunable resonator cavity.

124. A method according to claim 109, wherein the cell comprises a tunable waveguide.

125. A method according to claim 109, further comprising supplying an electric field in the cell.

126. A method according to claim 125, wherein the electric field in the range of 0.1 to 10^4 V/m.

127. A method according to claim 125, wherein the electric field in the range of 1 to 10^3 V/m.

128. A method according to claim 109, further comprising supplying an electric field in the cell for adjusting a rate of catalysis of hydrogen.

129. A method according to claim 109, further comprising supplying an electric field in the cell for focusing the ions in the cell.

130. A method according to claim 109, further comprising supplying an electric field in the cell for imparting a drift velocity to the ions.

131. A method according to claim 109, further comprising converting power received by the antenna into electrical power.

132. A method according to claim 109, wherein the antenna comprises one or more coils.

133. A method according to claim 109, wherein the antenna comprises one or more coils located circumferentially about the cell which receive power in a direction of applied magnetic field during operation.

134. A method according to claim 109, further comprising an electrical load for receiving electrical power from the antenna.

135. A method according to claim 109, further comprising converting light into electrical power using at least one photovoltaic cell in communication with the cell.

136. A method according to claim 109, further comprising at least two spatially separated electrodes in the cell that comprise conducting materials of differing Fermi energies or ionization energies, creating a voltage between the electrodes by ionizing one electrode to a greater extent relative to another electrode.

137. A method according to claim 136, wherein at least two electrodes are at opposite sides of the cell.

138. A method according to claim 109, wherein the antenna receives electromagnetic radiation from the ions.

139. A method according to claim 109, wherein the antenna is tuned to receive electromagnetic radiation produced during operation of the cell such that the antenna has a receiving frequency that is resonate with a cyclotron frequency of at least one orbiting ion species.

140. A method according to claim 139, further comprising converting the received

electromagnetic radiation into electricity using a converter.

141. A method according to claim 109, wherein the antenna comprises a receiving and emitting antenna such that the antenna receive electromagnetic radiation produced during operation of the cell and transmits or broadcasts the electromagnetic radiation away from the cell.

142. A method according to claim 109, further comprising analyzing ions formed during operation using a cyclotron resonance spectrometer.

143. A method according to claim 109, further comprising a rectifer in communication with the antenna for rectifying the power output.

144. A method according to claim 109, wherein the plasma temperature is in the range of 1,000K to over 100,000K.

145. A method according to claim 109, further comprising applying an external field to the cell to group ions to produce coherent radiation.

146. A method according to claim 109, wherein the cell is operated to produce coherent radiation from the action of a self-consistent field produced by the ions.

147. A method according to claim 109, wherein the cell is operated to produce microwaves.

148. A method according to claim 147, wherein the cell is operated to produce ions traveling predominately along a desired axis to form an ion beam.

149. A method according to claim 148, further comprising applying a field to adjust the flow of the ion beam.

150. A method according to claim 148, wherein the ions comprise electrons and the ion beam comprises an electron beam.

151. A method according to claim 150, wherein the ions comprise electrons and the ion beam comprises an electron beam.

152. A method according to claim 147, wherein the microwaves are coherent.

153. A method according to claim 109, wherein the cyclotron or power source comprises a magnetron having a cathode and an anode, further comprising converting potential energy of the ions into microwave power as the ions drift from the cathode to the anode.

154. A method according to claim 109, wherein the cyclotron or power source comprises a

Cherenkov device in which the ions move in a medium with a refractive index of $n>1$, the ion velocity v is greater than the phase velocity of electromagnetic waves, $v_{ph} = c/n$, where c is the vacuum speed of light.

155. A method according to claim 154, wherein the device comprises a traveling-wave tube.

156. A method according to claim 154, wherein the device comprises a backward wave oscillator.

157. A method according to claim 109, wherein the cyclotron or power source comprises a Smith-Purcell device.

158. A method according to claim 109, wherein the cyclotron or power source comprises a Klystron device having one or more cavities separated by drift spaces, and further comprising forming ion bunches from an initially uniform ion flow by modulating the ion velocity using an axial electric field of a transverse magnetic mode, followed by an output cavity that produces coherent radiation by decelarating the ion bunches.

159. A method according to claim 109, wherein the cyclotron or power source comprises a deflection-modulation device having an input cavity, drift space and an output cavity, further comprising modulating ions in the input cavity using an input signal, drifting the ions across the drift space in a beam, which is free of microwaves, and decelarating an ion beam in an output cavity using microwave fields.

160. A method according to claim 159, wherein a linear ion beam is deflected by transverse fields of a rotating RF mode, the direction of the rotation rotates at the RF frequency, and after transit through an unmagnetized drift space, the transverse deflection produces a transverse displacement of the ion beam that enters the output cavity at an off-axis position that traverses a circle about the axis at the RF frequency.

161. A method according to claim 160, wherein the output cavity contains a mode which phase velocity about the axis is synchronous with a scanning motion of the ion beam.

162. A method according to claim 161, wherein the transverse size of the ion beam in the output cavity is smaller than the radiation wavelength.

163. A method according to claim 109, wherein the cyclotron comprises a scanning-beam device.

164. A method according to claim 109, wherein the cyclotron comprises a gyrocon device.

165. A method according to claim 109, wherein the cyclotron comprises a bremsstrahlung device in which the ions oscillate in external magnetic or electric fields.

166. A method according to claim 165, wherein ion oscillations are induced by constant or periodic fields.

167. A method according to claim 109, wherein the cyclotron comprises a cyclotron resonance maser device in which the ions oscillate in a constant magnetic field.

168. A method according to claim 109, wherein the cyclotron comprises a smooth anode magnetron device in which electrons are absorbed from an interaction space.

169. A method according to claim 109, wherein the cyclotron comprises a phasochronous device.

170. A method according to claim 109, wherein the cyclotron comprises a cyclostron autoresonance maser device.

171. A method according to claim 170, wherein an electromagnetic wave propagates in a direction of a static magnetic field with a phase velocity equal to the speed of light.

172. A method according to claim 109, wherein the cyclotron comprises a cyclotron resonance maser in which coherent radiation of electromagnetic waves is produced by ions rotating in a magnetic field.

173. A method according to claim 172, in which the magnetic field is non-homogeneous.

174. A method according to claim 109, wherein the cyclotron comprises a gyrotron.

175. A method according to claim 174, wherein a beam of ions are moving in a constant magnetic field and interact with electromagnetic waves excited in an irregular waveguide.

176. A method according to claim 174, wherein a beam of ions is moving in a non-homogenous magnetic field.

177. A method according to claim 109, wherein the cyclotron comprises a relativistic gyrotron device.

178. A method according to claim 177, in which an axially inhomogeneous magnetic field is applied.

179. A method according to claim 109, wherein the cyclotron comprises a gyrotron in which the ions are relativistic and a variable magnetic field is used to decelerate the ions.

180. A method according to claim 109, wherein the cyclotron or power source comprises an

axisymetric gyrotron device.

181. A method according to claim 180, wherein the axisymetric gyrotron device comprises a cathode and a solenoid.

182. A method according to claim 180, wherein the cathode produces an electric field to cause a drift for an intense flow of ions.

183. A method according to claim 182, wherein the flow of ions is compressed by a magnetic field which increases in intensity in the direction from the cathode to an interaction space.

184. A method according to claim 180, wherein the axisymetric gyrotron device comprises a magnetic mirror.

185. A method according to claim 180, wherein the axisymetric gyrotron device comprises a reversed magnetic mirror.

186. A method according to claim 185, wherein ions are guided by quasi-uniform magnetic fields in an interaction space and then leave the space entering a region of decreasing field and settle on an extended surface collector.

187. A method according to claim 180, wherein the axisymetric gyrotron device comprises an extended surface collector.

188. A method according to claim 109, wherein the cyclotron comprises a gyrotron autogenerator device.

189. A method according to claim 109, wherein the cyclotron comprises a gyrotron and interaction takes place in a smooth metal waveguide.

190. A method according to claim 189, wherein the cyclotron is operated such that the ions comprise nonrelativistic electrons having a high velocity dispersion and arbitrary orientation with respect to the applied magnetic field.

191. A method according to claim 109, wherein a nonuniform waveguide is excited near its cutoff frequency and is stable with respect to the ion velocity dispersion, when the ion energies are low.

192. A method according to claim 109, wherein the cyclotron is operated above its self-excitation threshold, the power is extracted from the ions by an RF field and transferred to a load using an output waveguide that couples the cavity to the load.

193. A method according to claim 192, wherein the coupling is accomplished using a cavity

having a diffraction output for the RF field.

194. A method according to claim 192, wherein a wave transformer in the form of a corrugated waveguide is utilized.

195. A method according to claim 109, wherein the cyclotron comprises a magnetic induction power converter device.

196. A method according to claim 195, wherein power is received in a direction parallel to the direction of a magnetic flux.

197. A method according to claim 195, comprising at least one coil which produces a time dependent voltage, the coil being constructed and arranged to have a plane perpendicular to magnetic flux of the magnetic field.

198. A method according to claim 197, wherein the plasma is modulated in intensity with time.

199. A method according to claim 198, wherein the modulation is sinusoidal.

200. A method according to claim 199, wherein the modulation is sinusoidal at 60 Hz.

201. A method according to claim 198, wherein the modulation is achieved using an applied electric field to alter the catalysis rate.

202. A method according to claim 109, further comprising converting light produced in the hydrogen catalysis reaction into electricity using a photovoltaic power converter.

203. A method according to claim 202, further comprising converting a short wavelength light to longer wavelength light using a phosphor.

204. A method according to claim 109, wherein the catalyst comprises at least one metal atom selected from the group consisting of Li, Be, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Kr, Rb, Sr, Nb, Mo, Pd, Sn, Te, Cs, Pr, Sm, Gd, Dy, Pb, and Pt.

205. A method according to claim 109, wherein the catalyst comprises at least one ion selected from the group consisting of He^{+}, Na^{+}, Rb^{+}, Fe^{3+}, Mo^{2+}, Mo^{4+} and In^{3+}.

206. A method of making lower energy hydrogen comprising reacting hydrogen atoms with at least one metal atom catalyst selected from the group consisting of Li, Be, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Kr, Rb, Sr, Nb, Mo, Pd, Sn, Te, Cs, Pr, Sm, Gd, Dy, Pb, and Pt.